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Quasi-one-dimensional superfluid criticality[1] PIERRE-FRANCOIS DUC, MICHEL SAVARD, MATEI PETRESCU, McGill University, ADRIAN DEL MAESTRO, University of Vermont, GUILLAUME GERVAIS, McGill University — In one of the most celebrated examples of the theory of universal critical phenomena, superfluid ^{4}He state belongs to the same three dimensional O(2) universality class as the onset of ferromagnetism in a lattice of XY spins. Its ability to flow without viscosity below the λ-transition temperature is a paradigmatic manifestation of emergent phenomena and macroscopic quantum coherence, driven by both strong interactions and bosonic quantum statistics. As the number of spatial dimensions decreases, it is expected that enhanced thermal and quantum fluctuations should push $T_\lambda \to 0$. However, in the one dimensional limit, the universal quantum hydrodynamics of Luttinger liquid theory should apply, providing a host of theoretical predictions including the simultaneous algebraic spatial decay of both density-density and superfluid correlation functions. At McGill University, we have designed an experiment and measured the DC mass flow of superfluid helium in *single* nanopores with radii down to 3 nm. For the smaller aperture, in which helium is expected to be in a 'quasi-one-dimensional' regime, the universal critical exponent for the superfluid velocity is found to deviate significantly from its bulk value, $\nu = \frac{2}{3}$.

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